SOUTH DAKOTA STATEWIDE FISHERIES SURVEY

2102-F-21-R-42

Name: Lake Herman **County**: Lake
Legal Description: T106N- R53W- Sec.10-11,14-15, 22-23
Location from nearest town: 2 miles west of Madison, SD.

Dates of present survey: June 15-17, 2009, September 10, 2009 (electrofishing)
Dates of last survey: June 18-20, 2007, September 18, 2007 (electrofishing)
Most recent lake management plan: F-21-R-28 (January 1, 1995-December 31, 1999)
Management classification: Warmwater Marginal

Primary Game and Forage Species	Secondary and Other Species
Walleye	Northern Pike
Yellow Perch	Common Carp
Black Crappie	Bluegill
Black Bullhead	White Sucker
	Bigmouth Buffalo
	White Bass

PHYSICAL DATA

Surface area when full: 1,287 acres **Watershed area**: 36,275 acres
Maximum depth when full: 13 feet **Mean depth when full**: 4.7 feet
Lake elevation observed during the survey: Full
Ordinary high water mark elevation: 1,669.0 **Date set:** October, 1981
Outlet elevation: 1,668.4 **Date set:** October, 1981
Contour map available? Yes **Date prepared:** 2002
Beneficial use classification(s): (6) warmwater semipermanent fish propagation and irrigation (7) immersion recreation, (8) limited-contact recreation, (9) fish and wildlife propagation and stock watering.

Ownership of Lake and Adjacent Lakeshore Properties

Lake Herman is listed as a meandered public water in the State of South Dakota Listing of Meandered Lakes. The South Dakota Department of Game, Fish, and Parks (GFP) owns and manages a State Park on the east side of the lake and a Lake Access Area on the west side. The remainder of the shoreline is privately owned and heavily developed.

Fishing Access

Lake Herman State Park contains a double lane boat ramp with a dock, picnic tables, comfort stations, full service and primitive campgrounds. There are many areas suitable for shore fishing. The West Lake Access Area contains a single lane boat ramp with a dock and a public toilet. Shoreline access is limited.

Field Observations of Water Quality and Aquatic Vegetation

The water in Lake Herman was more clear than usual with a Secchi depth measurement of 1.5 meters (59 inches). Very little submerged vegetation was present but some common cattail can be found in the northwest and south bays.

BIOLOGICAL DATA

Methods:

Lake Herman was sampled on June 15-17, 2009 with three overnight gill-net sets and nine overnight trap-net sets. The trap nets are constructed with 19-mm-bar-mesh (¾ in) netting, 0.9 m high x 1.5 m wide (3 ft high x 5 ft wide) frames and 18.3 m (60 ft) long leads. The gill nets are 45.7 m long x 1.8 m deep (150 ft long x 6 ft deep) with one 7.6 m (25 ft) panel each of 13, 19, 25, 32, 38 and 51-mm-bar-mesh (½, ¾, 1, 1¼, 1½, and 2 in) monofilament netting. Two hours of nighttime electrofishing were done on September 10, 2009 to evaluate walleye recruitment. Sampling locations are displayed in Figure 5.

Results and Discussion:

Gill Net Catch

The gill-net catch was comprised mostly of white suckers (34.1%), yellow perch (33.3%) and black bullhead (13.6%) (Table 1). White bass, walleye, northern pike, and channel catfish were also sampled.

Table 1. Total catch from three overnight gill net sets at Lake Herman, Lake County June 18-20, 2009.

Species	#	Percent	CPUE[1]	80% C.I.	Mean CPUE*	PSD	RSD-P	Mean Wr
White Sucker	45	34.1	15.0	±2.2	8.6	100	76	103
Yellow Perch	44	33.3	14.7	±10.8	19.2	88	0	106
Black Bullhead	18	13.6	6.0	±4.5	14.6	17	0	112
White Bass	10	7.6	3.3	±1.9	0.2	--	--	--
Walleye	8	6.1	2.7	±2.1	34.5	--	--	--
Northern Pike	4	3.0	1.3	±0.9	0.2	--	--	--
Channel Catfish	3	2.3	1.0	±1.3	0.0	--	--	--

* 12 years (1991, 1992, 1994-1998, 1999, 2001, 2003, 2005, 2007)

[1] See Appendix A for definitions of CPUE, PSD, and mean Wr.

Table 2. Catch per unit effort by length category for various fish species captured with gill nets in Lake Herman June 15-17, 2009.

Species	Substock	Stock	S-Q	Q-P	P+	All sizes	80% C.I.
White Sucker	--	15.0	--	3.7	11.3	15.0	±2.2
Yellow Perch	--	14.7	1.7	13.0	--	14.7	±10.8
Black Bullhead	--	6.0	5.0	1.0	--	6.0	±4.5
White Bass	1.3	2.0	1.7	--	0.3	3.3	±1.9
Walleye	--	2.7	0.7	1.7	0.3	2.7	±2.1
Northern Pike	--	1.3	--	1.3	--	1.3	±0.9
Channel Catfish	0.7	0.3	0.3	--	--	1.0	±1.3

Length categories can be found in Appendix A.

Trap Net Catch

Black bullhead dominated the trap-net catch (82.2%, Table 3). Nine other fish species were also sampled.

Table 3. Total catch from ten overnight trap net sets at Lake Herman, Lake County, June 15-17, 2009.

Species	Number	Percent	CPUE	80% C.I.	Mean CPUE*	PSD	RSD-P	Mean Wr
Black Bullhead	1,210	82.2	134.4	±41.0	130.2	41	0	110
White Sucker	100	6.8	11.1	±3.9	8.4	100	100	94
Bigmouth Buffalo	91	6.2	10.1	±5.7	11.1	95	9	99
Channel Catfish	19	1.3	2.1	±2.1	0.0	--	--	--
Walleye	19	1.3	2.1	±0.6	4.8	46	8	--
White Bass	17	1.2	1.9	±1.5	0.1	100	76	86
Bluegill	7	0.5	0.8	±0.5	0.1	--	--	--
Yellow Perch	5	0.3	0.6	±0.3	0.7	--	--	--
Northern Pike	3	0.2	0.3	±0.4	1.3	--	--	--
Black Crappie	1	0.1	0.1	±0.1	10.2	--	--	--

*11 years (1991, 1992,1994-1997, 1999, 2001, 2003, 2005, 2007)

Table 4. Catch per unit effort by length category for various fish species captured with trap nets in Lake Herman June 15-17, 2009.

Species	Substock	Stock	S-Q	Q-P	P+	All sizes	80% C.I.
Black Bullhead	25.3	109.1	64.9	44.2	--	134.4	±41.0
White Sucker	--	11.1	--	--	11.1	11.1	±3.9
Bigmouth Buffalo	--	10.1	0.5	8.7	0.9	10.1	±5.7
Channel Catfish	1.9	0.2	0.2	--	--	2.1	±2.1
Walleye	0.7	1.4	0.7	0.6	0.1	2.1	±0.6
White Bass	--	1.9	--	0.5	1.4	1.9	±1.5
Bluegill	--	0.8	0.1	0.7	--	0.8	±0.5
Yellow Perch	--	0.6	0.1	0.5	--	0.6	±0.3
Northern Pike	0.1	0.2	--	0.2	--	0.3	±0.4
Black Crappie	--	0.1	0.1	--	--	0.1	±0.1

Length categories can be found in Appendix A.

Walleye

Management objective: Maintain a walleye population with a gill-net CPUE of at least 15, a PSD range of 30-60, and a growth rate of 14 inches by age-3.

Walleye gill-net CPUE has steadily declined since 2003 (Table 5) and is well below the management objective. Most sampled fish were from the fry-stocked 2005 year class (Table 6) and averaged 433 mm (17.0 inches; Figure 1) in length.

Table 5. Walleye gill-net CPUE, PSD, RSD-P, and mean Wr for Lake Herman, Lake County, 2001-2009.

	2001	2002	2003	2004	2005	2006	2007	2008	2009	Mean*
CPUE	4.7		20.0		11.5		12.0		2.7	11.7
PSD	25		40		5		8		--	17
RSD-P	0		3		3		3		--	3
Mean Wr	85		94		87		86		--	87

*5 years (1999, 2001, 2003, 2005, 2007)

Table 6. Weighted mean length at capture (mm) for walleye captured in gill nets in Lake Herman, Lake County, 1999-2009. Note: sampling was conducted at approximately the same time during each year allowing comparisons among years to monitor growth trends. Sample size in parentheses.

Year	1	2	3	4	5	6	7	8	9	10	11	12
2009	--	263	--	433	--	550	--	--	--	--	--	--
(8)		(2)		(5)		(1)						
2007	--	303	360	377	--	--	644	--	--	--	--	--
(36)		(31)	(1)	(3)			(1)					
2005	215	259	--	--	479	--	710	--	--	--	--	--
(46)	(2)	(42)			(1)		(1)					
2003	--	354	406	453	500	480	--	--	--	--	--	--
(80)		(45)	(26)	(3)	(4)	(2)						
2001	218	--	357	366	--	--	--	--	--	--	--	--
(14)	(6)		(5)	(3)								
1999	195	291	336	410	--	--	--	--	--	--	--	--
(50)	(4)	(4)	(37)	(5)								

A weak walleye year class was naturally-produced in 2009(Table 7). The size of age-0 walleyes improved from preceding years, although the condition of the fish is still relatively poor. Age-1 walleye were present indicating some survival of small walleyes from the 2008 year class. Age-1 walleyes were still small for their age, and their condition was poor.

Table 7. Age-0 and age-1 walleyes sampled by nighttime electrofishing on Lake Herman, Lake County, 1996-2009.

Year	Stocking	Age-0 CPH	80% C.I.	% stocked	Mean length (range; mm)	Wr	Age-1 CPH	80% C.I.	Mean length (range; mm)	Wr
2009	none	7	3-11		146 (138-158)	81	10	8-12	224 (197-230)	77
2008	fry	65	35-95	73[2]	107 (87-146)	88	24	13-35	214 (177-251)	103
2007	fry	117	81-141	94	104 (86-207)	90	0			
2006	none	0					47	6-86	271 (229-325)	90
2005	fry	142	68-216	100	155 (111-192)	87	0			
2004	none	1	0-2		151 (146-155)	86	54	37-70	241 (207-280)	83
2003	fingerling	293	166-419	100	160 (125-187)	92	0			
2002	none	0					7	0-15	311 (277-341)	104
2001	none	133	110-157		158 (122-184)	91	9	5-13	283 (198-314)	87
2000	fry	35	21-49	[1]	167 (142-195)	91	0			
1999	none	5			200 (192-212)		65			
1998	fry	72		99	145 (106-178)		104			
1997	fry	93		100	149 (121-182)		11			
1996	fry	24		100	144 (125-163)		247			

[1] No evaluation done.

[2] OTC marks were faint; and therefore, I had difficulty discerning marked from unmarked fish. I believe that there was a greater likelihood of incorrectly identifying marked individuals as unmarked rather than unmarked fish as marked.

Yellow Perch

Management objective: Maintain a gill-net CPUE of at least 50 with a PSD range of 30-60.

Yellow perch gill net CPUE increased from 2007 but remains below the management objective (Table 8). Recruitment has been very low for several years, a common occurrence on many Region III lakes. The perch sampled ranged in length from 170 –230 mm (6.7–9.1 in) (Figure 2) and were in very good condition with a mean Wr of 106 (Table 8). Yellow perch fry (7,539,000) were stocked in spring 2009 but we did not sample any Age-0 yellow perch seining in August or electrofishing later in the fall.

Table 8. Yellow perch gill-net CPUE, PSD, RSD-P, and mean Wr for Lake Herman, Lake County, 2001-2009.

	2001	2002	2003	2004	2005	2006	2007	2008	2009	Mean*
CPUE	18.3		28.0		13.0		4.3		14.7	14.8
PSD	83		96		86		100		88	75
RSD-P	5		10		74		69		0	42
Mean Wr	104		107		101		100		106	99

*5 years (1999, 2001, 2003, 2005, 2007)

Black Crappie

Management objective: Maintain a black crappie fishery with a trap net CPUE of at least 20 and PSD of at least 40.

Black crappie trap net CPUE in 2009 declined from 2007 with only one fish sampled (Table 9) (Figure 3).

Table 9. Black crappie trap-net CPUE, PSD, RSD-P, and mean Wr for Lake Herman, Lake County, 2001-2009.

	2001	2002	2003	2004	2005	2006	2007	2008	2009	Mean*
CPUE	16.3		4.4		0.2		5.9		0.1	5.6
PSD	82		98		--		97		--	92
RSD-P	1		7		--		15		--	8
Mean Wr	108		113		--		104		--	108

*5 years (1999, 2001, 2003, 2005, 2007)

Black Bullhead

Management objective: Maintain a black bullhead population with a trap-net net CPUE of no more than 100.

Black bullhead trap net CPUE increased again in 2009 (Table 10), and is now above the management objective. Several year classes and a wide range of lengths from 110 mm to 290 mm (4.3 – 11.4 in) were sampled. Over 40% of the catch measured over 23 cm (9 in), the minimum size typically harvested by anglers. (Figure 4).

Table 10. Black bullhead trap-net CPUE, PSD, RSD-P, and mean Wr for Lake Herman, Lake County, 2001-2009.

	2001	2002	2003	2004	2005	2006	2007	2008	2009	Mean*
CPUE	30.2		480.4		21.3		32.2		134.4	127.8
PSD	95		91		97		41		41	82
RSD-P	40		6		60		11		0	30
Mean Wr	--		100		94		88		110	94

*5 years (1999, 2001, 2003, 2005, 2007)

All Species

White bass were first sampled in 2007 and their abundance is increasing slowly. CPUE for channel catfish and bluegill have also increased. Numbers of northern pike, and white sucker have remained relatively constant (Table 11). No common carp were captured with gill nets or trap nets, in spite of the high population estimates from the SDSU project.

Table 11. Gill-net (GN) and trap-net (TN) CPUE for all fish species sampled in Lake Herman, Lake County, 2001-2009.

Species	2001	2002	2003	2004	2005	2006	2007	2008	2009
COC (GN)	2.0		0.3		0.5		0.3		--
COC (TN)	2.5		0.9		0.4		0.6		--
WHS (GN)	5.3		14.0		13.8		15.3		15.0
WHS (TN)	17.1		6.7		1.2		12.4		11.1
BIB (GN)	--		--		5.8		0.3		--
BIB (TN)	5.8		1.2		99.4		5.8		10.1
BLB (GN)	1.7		21.8		0.5		1.7		6.0
BLB (TN)	30.2		480.4		21.3		32.2		134.4
CCF (GN)	--		--		--		--		1.0
CCF (TN)	--		--		0.1		--		2.1
NOP (GN)	--		1.5		--		0.7		1.3
NOP (TN)	0.9		0.4		0.2		1.0		0.3
WHB (GN)	--		--		--		2.7		3.3
WHB (TN)	--		--		--		0.6		1.9
GSF (GN)	--		--		--		--		--
GSF (TN)	--		0.4		--		--		--
BLG (GN)	--		--		--		--		--
BLG (TN)	--		0.1		--		0.5		0.8
SMB (GN)	--		--		--		--		--
SMB (TN)	--		0.1		0.1		--		--
BLC (GN)	--		--		--		--		--
BLC (TN)	16.3		4.4		0.2		5.9		0.1
YEP (GN)	18.3		28.0		13.0		4.3		14.7
YEP (TN)	5.1		1.8		--		0.6		0.6
WAE (GN)	4.7		20.0		11.5		12.0		2.7
WAE (TN)	2.3		1.2		--		5.0		2.1

COC (Common Carp), WHS (White Sucker),BIB (Bigmouth Buffalo), BLB (Black Bullhead),CCF (Channel Catfish), NOP (Northern Pike), WHB (White Bass), GSF (Green Sunfish), BLG (Bluegill), SMB (Smallmouth Bass), BLC (Black Crappie), YEP (Yellow Perch), WAE (Walleye),

MANAGEMENT RECOMMENDATIONS

1. Conduct annual lake surveys to monitor the fish populations.

2. Stock walleye fry or fingerlings as needed to fill gaps of failed natural reproduction.

3. Consider a habitat improvement plan that will benefit panfish and walleye reproduction, increase survival of young fish, reduce the number of rough fish, and improve water quality.

Table 12. Stocking record for Lake Herman, Lake County, 1991-2009.

Year	Number	Species	Size
1991	41,640	Yellow Perch	Fingerling
	17,800	Walleye	Lrg. Fingerling
	6,421	Walleye	Med. Fingerling
1992	170,000	Saugeye	Sml. Fingerling
	145	Walleye	Lrg. Fingerling
	162,500	Yellow Perch	Fingerling
1993	67,500	Saugeye	Sml. Fingerling
	67,500	Walleye	Sml. Fingerling
1995	41,000	Fathead Minnow	Adult
	135,000	Walleye	Fingerling
1996	2,707,000	Walleye	Fry
	136,840	Yellow Perch	Fingerling
1997	2,700,000	Walleye	Fry
1998	2,700,000	Walleye	Fry
1999	13,572	Yellow Perch	Adult
2000	126,474	Walleye	Fingerling
	2,800	Yellow Perch	Adult
2003	137,620	Walleye	Fingerling
2005	2,000,000	Walleye	Fry
2007	1,400,000	Walleye	Fry
2008	1,400,000	Walleye	Fry
2009	7,539,000	Yellow Perch	Fry

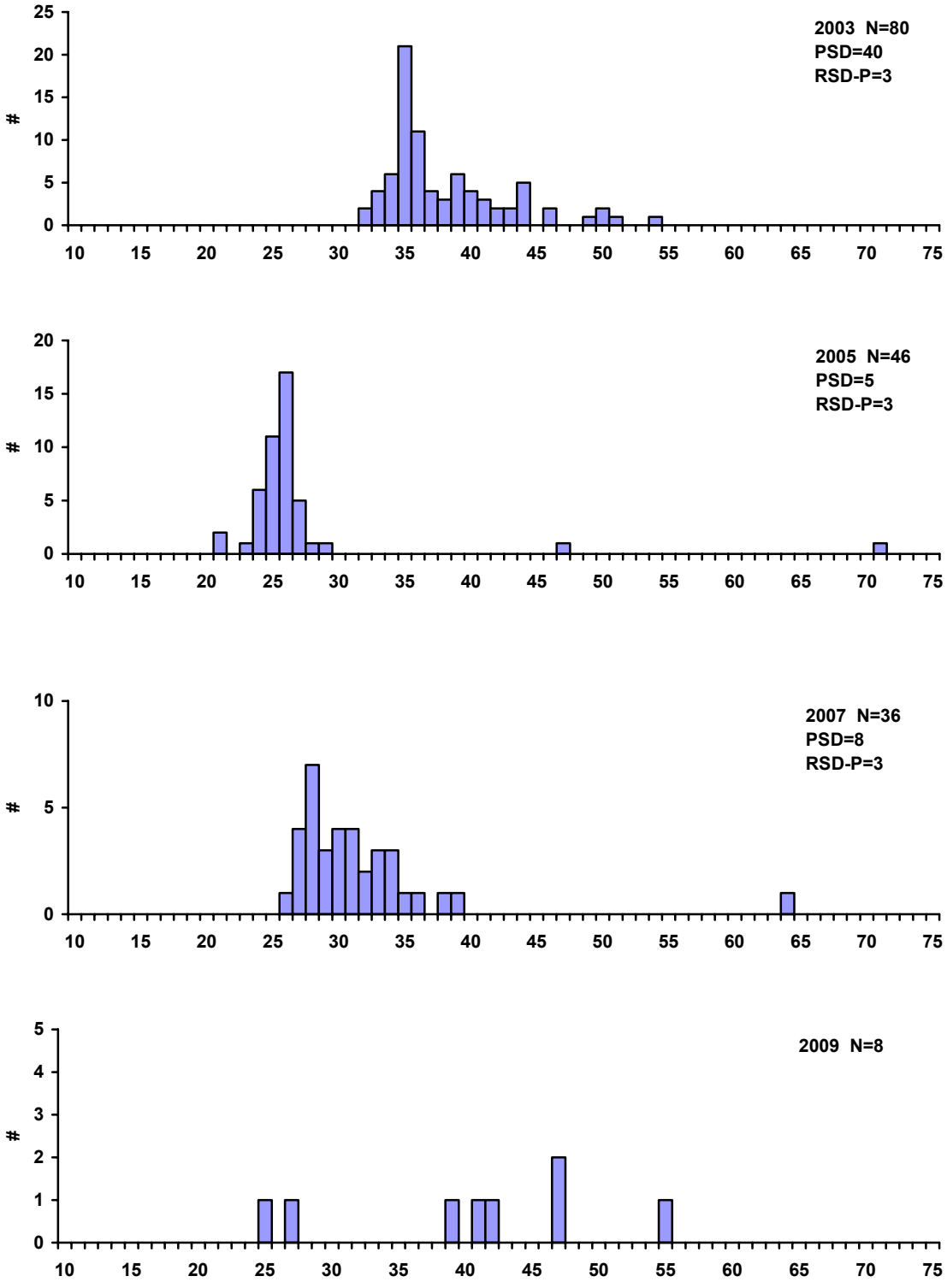

Figure 1. Length frequency histograms for walleye sampled with gill nets in Lake Herman, Lake County, 2003, 2005, 2007, 2009.

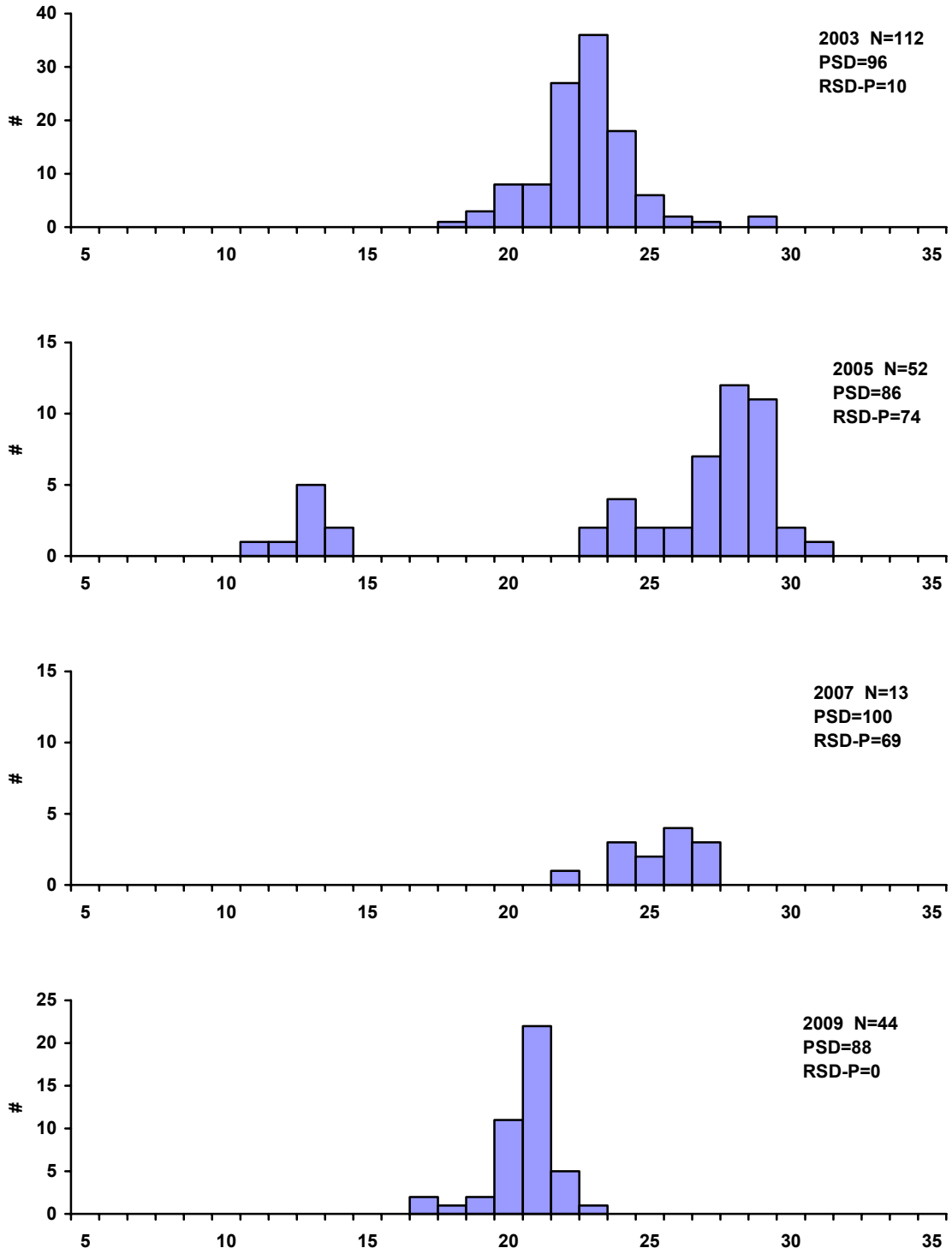

Figure 2. Length frequency histograms for yellow perch sampled with gill nets in Lake Herman, Lake County, 2003, 2005, 2007, 2009.

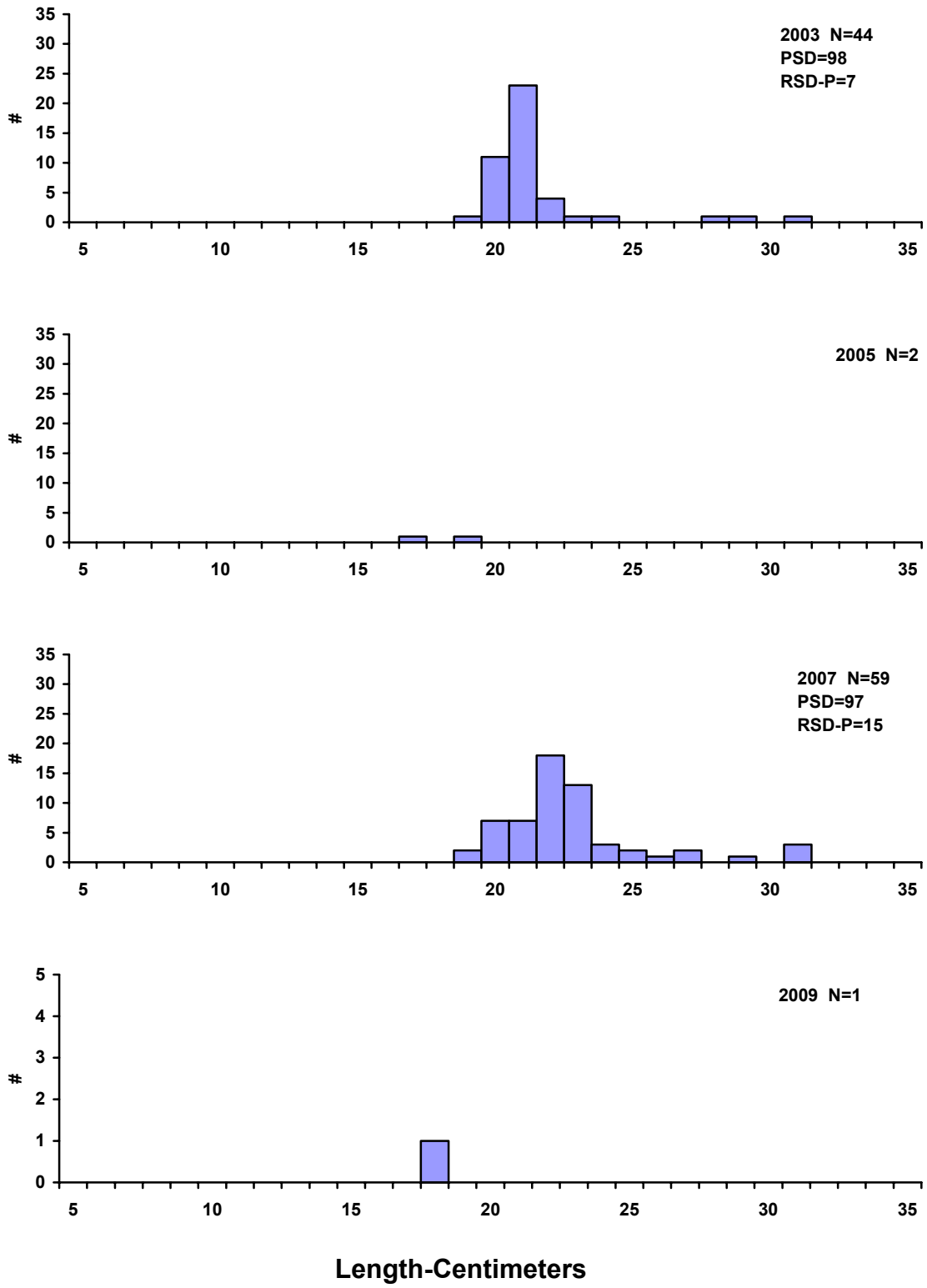

Figure 3. Length frequency histograms for black crappies sampled with trap nets in Lake Herman, Lake County, 2003, 2005, 2007, 2009.

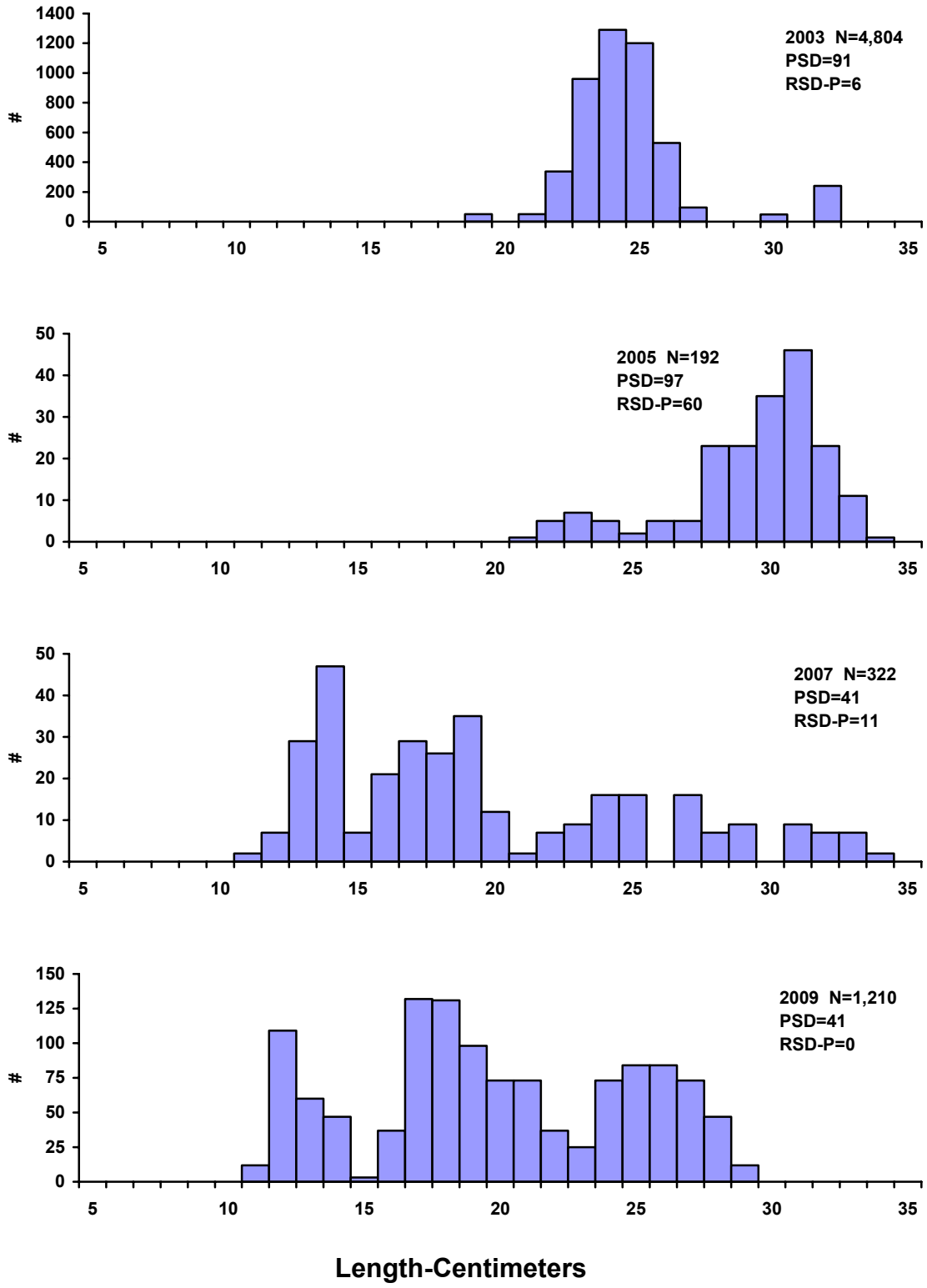

Figure 4. Length frequency histograms for black bullheads sampled with trap nets in Lake Herman, Lake County, 2003, 2005, 2007, 2009.

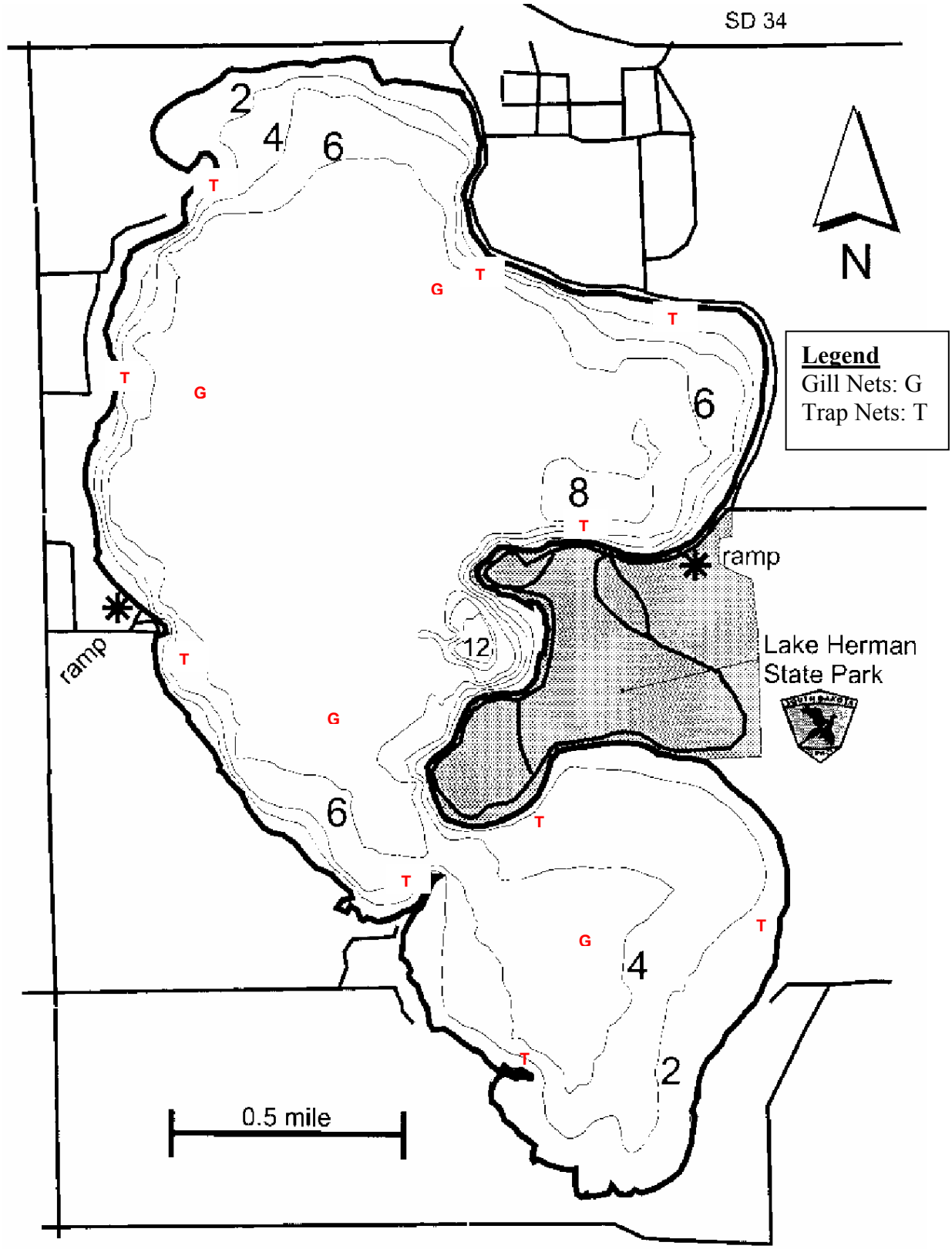

Figure 5. Sampling locations on Lake Herman, Lake County, 2009.

Appendix A. A brief explanation of catch per unit effort (CPUE), proportional stock density (PSD), relative stock density (RSD) and relative weight (Wr).

Catch Per Unit Effort (CPUE) is the catch of animals in numbers or in weight taken by a defined period of effort. Can refer to trap-net nights of effort, gill-net nights of effort, catch per hour of electrofishing, etc.

Proportional Stock Density (PSD) is calculated by the following formula:

$$PSD = \frac{\text{Number of fish} > \text{quality length}}{\text{Number of fish} \geq \text{stock length}} \times 100$$

Relative Stock Density (RSD-P) is calculated by the following formula:

$$RSD\text{-}P = \frac{\text{Number of fish} > \text{preferred length}}{\text{Number of fish} \geq \text{stock length}} \times 100$$

PSD and RSD-P are unitless and usually calculated to the nearest whole digit.

Size categories for selected species found in Region 3 lake surveys, in centimeters.

Species	Stock	Quality	Preferred	Memorable	Trophy
Walleye	25	38	51	63	76
Sauger	20	30	38	51	63
Yellow perch	13	20	25	30	38
Black crappie	13	20	25	30	38
White crappie	13	20	25	30	38
Bluegill	8	15	20	25	30
Largemouth bass	20	30	38	51	63
Smallmouth bass	18	28	35	43	51
Northern pike	35	53	71	86	112
Channel catfish	28	41	61	71	91
Black bullhead	15	23	30	38	46
Common carp	28	41	53	66	84
Bigmouth buffalo	28	41	53	66	84
Smallmouth buffalo	28	41	53	66	84

For most fish, 30-60 or 40-70 are typical objective ranges for “balanced” populations. Values less than the objective range indicate a population dominated by small fish while values greater than the objective range indicate a population comprised mainly of large fish.

Relative weight (Wr) is a condition index that quantifies fish condition (i.e., how much does a fish weigh for its length). A Wr range of 90-100 is a typical objective for most fish species. When mean Wr values are well below 100 for a size group, problems may exist in food and feeding relationships. When mean Wr values are well above 100 for a size group, fish may not be making the best use of available prey.